

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61K 31/415, 31/675, 31/335		A1	(11) International Publication Number: WO 98/32440 (43) International Publication Date: 30 July 1998 (30.07.98)
(21) International Application Number: PCT/US98/01147 (22) International Filing Date: 21 January 1998 (21.01.98)		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(30) Priority Data: 08/788,482 28 January 1997 (28.01.97) US		Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(71) Applicant: THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).			
(72) Inventor: CAMDEN, James, Berger; 7339 Charter Cup, West Chester, OH 45069 (US).			
(74) Agents: REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).			
(54) Title: KIT FOR INHIBITING THE GROWTH OF CANCERS, COMPRISING A CHEMOTHERAPEUTIC AGENT AND A BENZIMIDAZOLE, AND OPTIONALLY A POTENTIATOR			
(57) Abstract			
A method for inhibiting the growth of tumors and cancers in mammals comprising administering a chemotherapeutic agent to significantly reduce the tumor in mass and then administering a benzimidazole derivative. Potentiators can also be included in the benzimidazole composition.			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	L.I.	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

KIT FOR INHIBITING THE GROWTH OF CANCERS, COMPRISING A CHEMOTHERAPEUTIC AGENT AND A BENZIMIDAZOLE, AND OPTIONALLY A POTENTIATOR

TECHNICAL FIELD

5 This invention is a method of inhibiting the growth of cancers and tumors in mammals, particularly in human and warm blooded animals. The method involves the sequential administration of chemotherapeutic agents which reduce the tumor size and a benzimidazole derivative, preferably carbendazim or 2-methoxycarbonylamino-benzimidazole, in either order.

10 BACKGROUND OF THE INVENTION

Cancers are a leading cause of death in animals and humans. The exact cause of cancer is not known, but links between certain activities such as smoking or exposure to carcinogens and the incidence of certain types of cancers and tumors has been shown by a number of researchers.

15 Many types of chemotherapeutic agents have been shown to be effective against cancers and tumor cells, but unfortunately, many of these agents also destroy normal cells. Despite advances in the field of cancer treatment the leading therapies to date are surgery, radiation and chemotherapy. Chemotherapeutic approaches are said to fight cancers that are metastasized or ones that are particularly aggressive. Such cytoidal or 20 cytostatic agents work best on cancers with large growth factors, i.e., ones whose cells are rapidly dividing. The exact mechanism for the action of these chemotherapeutic agents are not always known. Moreover, while some chemotherapeutic agents reduce the tumor mass significantly after one treatment, they unfortunately cannot be administered again to the same patient when the tumor returns as is usually the case. Some can only be 25 administered once in a lifetime, others require several months or years delay between treatments.

Clearly, the development of materials that would target tumor cells due to some unique specificity for them would be a breakthrough. Alternatively, materials that were cytotoxic to tumor cells while exerting mild effects on normal cells would be desirable. It 30 has been found that the benzimidazoles are especially effective in suppressing the growth of the cancers and tumors. The use of these benzimidazoles in sequential combination with other chemotherapeutic agents which are effective in debulking the tumor is a novel method of treatment. The preferred method involves first debulking or reducing the mass of the tumor with a cytotoxic agent and then administering the benzimidazoles.

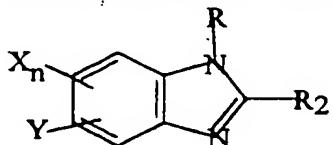
It is an object of this invention to provide an anti-cancer therapy comprising a administering a chemotherapeutic agent first to reduce the mass of the tumor and then administering a benzimidazole derivative as defined herein to maintain or destroy the cancer. The agents may also be administered with the benzimidazole first and then the 5 chemotherapeutic agent.

The benzimidazole can be administered in conjunction with a potentiator.

These and other objects will become evident from the following detailed description of this inventions.

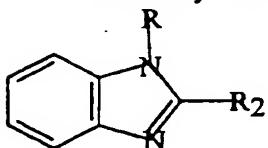
SUMMARY OF THE INVENTION

10 A method of treating cancer in mammals, and in particular, warm blooded animals and humans, comprising administering a chemotherapeutic agent which significantly reduces the mass of the tumor or cancer, and then administering a safe and effective amount of a benzimidazole selected from the group consisting of:



15 wherein X is hydrogen, halogen, alkyl of less than 7 carbon atoms or alkoxy of less than 7 carbon atoms; n is a positive integer of less than 4; Y is hydrogen, chlorine, nitro, methyl or ethyl; and R is hydrogen, or an alkyl group of from 1 to 8 carbon atoms or CONHR₃ and R₃ is alkyl of less than 7 carbons, preferably butyl or isobutyl, and R₂ is 4-thiazolyl, NHCOOR₁ wherein R₁ is aliphatic hydrocarbon of less than 7 carbon atoms, 20 and preferably an alkyl group of less than 7 carbon atoms is claimed.

Preferably the compositions are:



25 wherein R is hydrogen or CONHR₃ and R₃ is alkyl of less than 7 carbons, preferably butyl or isobutyl or an alkyl of 1 through 8 carbon atoms and R₂ is selected from the group consisting of 4-thiazolyl, NHCOOR₁, wherein R₁ is methyl, ethyl or isopropyl and the non-toxic, pharmaceutically acceptable acid addition salts with both organic and inorganic acids. The most preferred compounds are 2-(4-thiazolyl)benzimidazole, methyl -(butylcarbamoyl)-2-benzimidazolecarbamate and 2-methoxycarbonylamino-benzimidazole and those wherein Y is chloro.

These compositions can be used to inhibit the growth of cancers and other tumors in humans or animals by administration of an effective amount either orally, rectally, topically or parenterally, intravenously or by injection into the tumor. Potentiators can also be used with this composition.

5

DETAILED DESCRIPTION OF THE INVENTION

A. DEFINITIONS:

As used herein, the term "comprising" means various components can be conjointly employed in the pharmaceutical composition of this invention. Accordingly, the terms "consisting essentially of" and "consisting of" are embodied in the term 10 comprising.

As used herein, a "pharmaceutically acceptable" component is one that is suitable for use with humans and/or animals without undue adverse side effects (such as toxicity, irritation, and allergic response) commensurate with a reasonable benefit/risk ratio.

As used herein, the term "safe and effective amount" refers to the quantity of a 15 component which is sufficient to yield a desired therapeutic response without undue adverse side effects (such as toxicity, irritation, or allergic response) commensurate with a reasonable benefit/risk ratio when used in the manner of this invention. The specific "safe and effective amount" will, obviously, vary with such factors as the particular condition being treated, the physical condition of the patient, the type of mammal being 20 treated, the duration of the treatment, the nature of concurrent therapy (if any), and the specific formulations employed and the structure of the compounds or its derivatives.

As used herein, a "pharmaceutical addition salts" is salt of the benzimidazoles and 25 their derivatives with an organic or inorganic acid. These preferred acid addition salts are chlorides, bromides, sulfates, nitrates, phosphates, sulfonates, formates, tartrates, maleates, malates, citrates, benzoates, salicylates, ascorbates, and the like.

As used herein, a "pharmaceutical carrier" is a pharmaceutically acceptable 30 solvent, suspending agent or vehicle, including liposomes, for delivering the anti-cancer agent to the animal or human. The carrier may be liquid or solid and is selected with the planned manner of administration in mind.

As used herein, "cancer" refers to all types of cancers or neoplasm or malignant tumors found in mammals, including tumors and leukemia.

As used herein, the "benzimidazoles, and their salts" are described in detail below. Preferred materials are the products sold under the names "thiabendazole®", "benomyl®" and "carbendazim®" by BASF and Hoechst, DuPont and MSD-AgVet.

As used herein "chemotherapeutic agents" includes DNA-interactive Agents, Antimetabolites, Tubulin-Interactive Agents, Hormonal agents and others, such as Asparaginase or hydroxyurea.

As used herein "potentiators" are materials such as triprolidine and its *cis*-isomer 5 and procodazole which are used in combination with the chemotherapeutic agents and benzimidazoles.

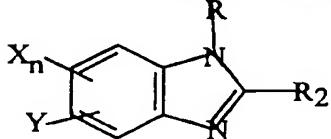
As used herein "significantly reduce" means to reduce the mass of the tumor by significant amount. This will usually be to less than 50% of its original mass, and preferably to reduce the mass to non-detectable amounts.

10 B. THE BENZIMIDAZOLES COMPOUNDS

The benzimidazole derivatives are known for their antifungal activities. Surprisingly it has been found that these compounds can also cause apoptosis in cancer cell lines. Apoptosis is specific cell death which differs from necrosis. Most cancer cells can live indefinitely; cancer cells are often referred to as immortalized cell lines.

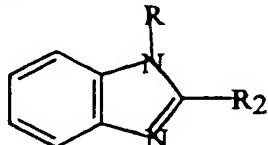
15 Therefore the ability to induce apoptosis is very important.

The compounds have the following structure:



wherein X is hydrogen, halogen, alkyl of less than 7 carbon atoms or alkoxy of less than 7 carbon atoms; n is a positive integer of less than 4; Y is hydrogen, chlorine, nitro,

20 methyl or ethyl; and R is hydrogen, CONHR3 and R3 is alkyl of less than 7 carbons, preferably butyl or isobutyl or an alkyl group having from 1 to 8 carbons, and R2 is 4-thiazolyl, NHCOOR1 wherein R1 is aliphatic hydrocarbon of less than 7 carbon atoms, and preferably an alkyl group of less than 7 carbon atoms. Preferably the compositions are:



25 wherein R is hydrogen, CONHR3 and R3 is alkyl of less than 7 carbons, preferably butyl or isobutyl or an alkyl of 1 through 8 carbon atoms and R2 is selected from the group consisting of 4-thiazolyl, NHCOOR1, wherein R1 is methyl, ethyl or isopropyl and the non-toxic, pharmaceutically acceptable acid addition salts with both organic and inorganic acids.

The most preferred compounds are 2-(4-thiazolyl)benzimidazole, methyl-(butylcarbamoyl)-2-benzimidazolecarbamate and 2-methoxycarbonylamino-benzimidazole and the compounds wherein Y is chloro and X is hydrogen.

These compounds are prepared according to the method described in U.S.

5 3,738,995 issued to Adams et al, June 12, 1973. The thiazolyl derivatives are prepared according to the method described in Brown et al., *J. Am. Chem. Soc.*, **83**, 1764 (1961) and Grenda et al., *J. Org. Chem.*, **30**, 259 (1965).

C. CHEMOTHERAPEUTIC AGENTS

The chemotherapeutic agents are generally grouped as DNA-interactive Agents, 10 Antimetabolites, Tubulin-Interactive Agents, Hormonal agents and others such as Asparaginase or hydroxyurea. Each of the groups of chemotherapeutic agents can be further divided by type of activity or compound. The chemotherapeutic agents used in the sequential method in combination benzimidazoles primarily include members of the DNA-interactive Agents, Antimetabolites, Tubulin-Interactive Agents groups. For a 15 detailed discussion of the chemotherapeutic agents and their method of administration, see Dorr, et al, *Cancer Chemotherapy Handbook*, 2d edition, pages 15-34, Appleton & Lange (Connecticut, 1994) herein incorporated by reference.

In order to reduce the mass of the tumor or stop the growth of the cancer cells, 20 the chemotherapeutic agent must prevent the cells from replicating and also must interfere with the cell's ability to maintain itself. The agents which do this are primarily the DNA-interactive agents such as Cisplatin, and tubulin interactive agents.

DNA-Interactive Agents include the alkylating agents, e.g. Cisplatin, 25 Cyclophosphamide, Altretamine; the DNA strand-breakage agents, such as Bleomycin; the intercalating topoisomerase II inhibitors, e.g., Dactinomycin and Doxorubicin); the nonintercalating topoisomerase II inhibitors such as, Etoposide and Teniposide; and the DNA minor groove binder Plcamydin.

The alkylating agents form covalent chemical adducts with cellular DNA, RNA, 30 and protein molecules and with smaller amino acids, glutathione and similar chemicals. Generally, these alkylating agents react with a nucleophilic atom in a cellular constituent, such as an amino, carboxyl, phosphate, sulphydryl group in nucleic acids, proteins, amino acids, or glutathione. The mechanism and the role of these alkylating agents in cancer therapy is not well understood. Typical alkylating agents include:

Nitrogen mustards, such as Chlorambucil, Cyclophosphamide, Ifosfamide, 35 Mechlorethamine, Melphalan, Uracil mustard;
aziridines such as Thiotepa;
methanesulfonate esters such as Busulfan;

nitroso ureas, such as Carmustine, Lomustine, Streptozocin; platinum complexes, such as Cisplatin, Carboplatin; bioreductive alkylator, such as Mitomycin, and Procarbazine, Dacarbazine and Altretamine;

5 DNA strand breaking agents include Bleomycin; DNA topoisomerase II inhibitors include the following:
 Intercalators, such as Amsacrine, Dactinomycin, Daunorubicin, Doxorubicin, Idarubicin, and Mitoxantrone;
 nonintercalators, such as Etoposide and Teniposide.

10 The DNA minor groove binder is Plicamycin.

 The antimetabolites interfere with the production of nucleic acids by one or the other of two major mechanisms. Some of the drugs inhibit production of the deoxyribonucleoside triphosphates that are the immediate precursors for DNA synthesis, thus inhibiting DNA replication. Some of the compounds are sufficiently like purines or 15 pyrimidines to be able to substitute for them in the anabolic nucleotide pathways. These analogs can then be substituted into the DNA and RNA instead of their normal counterparts. The antimetabolites useful herein include:
 folate antagonists such as Methotrexate and trimetrexate
 pyrimidine antagonists, such as Fluorouracil, Fluorodeoxyuridine, CB3717,

20 Azacytidine, Cytarabine, and Flouxuridine
 purine antagonists include Mercaptopurine, 6-Thioguanine, Fludarabine, Pentostatin;
 sugar modified analogs include Cytarabine, Fludarabine;
 ribonucleotide reductase inhibitors include hydroxyurea.

25 Tubulin Interactive agents act by binding to specific sites on tubulin, a protein that polymerizes to form cellular microtubules. Microtubules are critical cell structure units. When the interactive agents bind on the protein, the cell can not form microtubules. Tubulin Interactive agents include Vincristine and Vinblastine, both alkaloids and Paclitaxel.

30 Adrenal corticosteroids are derived from natural adrenal cortisol or hydrocortisone. They are used because of their anti inflammatory benefits as well as the ability of some to inhibit mitotic divisions and to halt DNA synthesis. These compounds include, Prednisone, Dexamethasone, Methylprednisolone, and Prednisolone.

 Hydroxyurea appears to act primarily through inhibition of the enzyme 35 ribonucleotide reductase.

 Asparaginase is an enzyme which converts asparagine to nonfunctional aspartic acid and thus blocks protein synthesis in the tumor.

The hormonal agents and leutinizing hormones are not usually used to substantially reduce the tumor mass. However, they can be used in conjunction with the chemotherapeutic agents or the benzimidazoles.

Hormonal blocking agents are also useful in the treatment of cancers and tumors.

- 5 They are used in hormonally susceptible tumors and are usually derived from natural sources. These include:
 - estrogens, conjugated estrogens and Ethinyl Estradiol and Diethylstilbestrol, Chlorotrianisene and Idenestrol;
 - progestins such as Hydroxyprogesterone caproate, Medroxyprogesterone, and
- 10 Megestrol;
 - androgens such as testosterone, testosterone propionate; fluoxymesterone, methyltestosterone;
 - Leutinizing hormone releasing hormone agents or gonadotropin-releasing hormone antagonists are used primarily the treatment of prostate cancer. These include
- 15 leuprolide acetate and goserelin acetate. They prevent the biosynthesis of steroids in the testes.
- 20 Antihormonal antigens include:
 - antiestrogenic agents such as Tamoxifen,
 - antiandrogen agents such as Flutamide ; and
 - antiadrenal agents such as Mitotane and Aminoglutethimide.

D. POTENTIATORS

The "potentiators" can be any material which improves or increases the efficacy of the pharmaceutical composition and/or act on the immune system. One such potentiator is triprolidine and its cis-isomer which are used in combination with the

- 25 chemotherapeutic agents and the benzimidazole. Triprolidine is described in US 5,114,951 (1992). Another potentiator is procodazole, 1H-Benzimidazole-2-propanoic acid; β -(2-benzimidazole) propionic acid; 2-(2-carboxyethyl)benzimidazole; propazol) Procodazole is a non-specific active immunoprotective agent against viral and bacterial infections and can be used with the compositions claimed herein.
- 30 The potentiators can improve the efficacy of the benzimidazole compounds and can be used in a safe and effective amount. These combinations can be administered to the patient or animal by oral, rectal, topical or parenteral administration.

Antioxidant vitamins such as ascorbic acid, beta-carotene, vitamin A and vitamin E can be administered with the compositions of this invention.

E. DOSAGE

Any suitable dosage can be given in the method of the invention. The type of compounds and the carriers and the amount will vary widely depending on the species of the warm blooded animal or human, body weight, and cancer, or tumor being treated.

5 The range and ratio of the chemotherapeutic agent and benzimidazoles and their derivatives used will depend on the type of chemotherapeutic agent and the cancer being treated. Generally, for the benzimidazoles a dosage of between about 2 milligrams (mg) per kilogram (kg) of body weight and about 4000 mg per kg of body weight is suitable. Higher dosages, up to 6000 mg/kg can also be used. Preferably from 15 mg to about 10 3000 mg/kg of body weight is used for the benzimidazoles. For the chemotherapeutic agents, a lower dosage may be appropriate, i.e., from about 0.01 mg/kg of body weight to about 400 mg/kg body weight, although amounts up to 1500 mg/kg can be used. Generally, the dosage in man is lower than for small warm blooded mammals such as mice. A dosage unit may comprise a single compound or mixtures thereof with other 15 compounds or other cancer inhibiting compounds. The dosage unit can also comprise diluents, extenders, carriers and the like. The unit may be in solid or gel form such as pills, tablets, capsules, liposomes and the like or in liquid form suitable for oral, rectal, topical, intravenous injection or parenteral administration or injection into or around the tumor.

20 **F. DOSAGE DELIVERY FORMS**

The benzimidazoles and their derivatives and chemotherapeutic agents are typically mixed with a pharmaceutically acceptable carrier. This carrier can be a solid or liquid or a liposome and the type is generally chosen based on the type of administration being used. The active agent can be coadministered in the form of a tablet or capsule, 25 liposome, or as an agglomerated powder or in a liquid form. Examples of suitable solid carriers include lactose, sucrose, gelatin and agar. Capsule or tablets can be easily formulated and can be made easy to swallow or chew; other solid forms include granules, and bulk powders. Tablets may contain suitable binders, lubricants, diluents, disintegrating agents, coloring agents, flavoring agents, flow-inducing agents, and melting 30 agents. Examples of suitable liquid dosage forms include solutions or suspensions in water, pharmaceutically acceptable fats and oils, alcohols or other organic solvents, including esters, emulsions, syrups or elixirs, suspensions, solutions and/or suspensions reconstituted from non-effervescent granules and effervescent preparations reconstituted from effervescent granules. Such liquid dosage forms may contain, for example, suitable 35 solvents, preservatives, emulsifying agents, suspending agents, diluents, sweeteners,

thickeners, and melting agents. Oral dosage forms optionally contain flavorants and coloring agents. Parenteral and intravenous forms would also include minerals and other materials to make them compatible with the type of injection or delivery system chosen.

Specific examples of pharmaceutical acceptable carriers and excipients that may 5 be used to formulate oral dosage forms of the present invention are described in US. Pat. No. 3,903,297 to Robert, issued Sept. 2, 1975. Techniques and compositions for making dosage forms useful in the present invention are described in the following references: 7 Modern Pharmaceutics, Chapters 9 and 10 (Banker & Rhodes, Editors, 1979); Lieberman et al., Pharmaceutical Dosage Forms: Tablets (1981); and Ansel, Introduction to 10 Pharmaceutical Dosage Forms 2nd Edition (1976).

G. METHOD OF TREATMENT

The method of treatment can be any suitable method which is effective in the treatment of the particular cancer or tumor type that is being treated. Treatment may be oral, rectal, topical, parenteral or intravenous administration or by injection into the 15 tumor and the like. The method of applying an effective amount also varies depending on the tumor being treated. It is believed that parenteral treatment by intravenous, subcutaneous, or intramuscular application of the benzimidazole compounds, formulated with an appropriate carrier, additional cancer inhibiting compound or compounds or diluent to facilitate application will be the preferred method of administering the 20 compounds to warm blooded animals.

Preferably, the chemotherapeutic agent is administered first to significantly reduce the size of the cancer or tumor mass. Usually this will take 3 to about 14 days. The reduction in the tumor or level of cancer cells will be to less than 50% of the original level. Radiation therapy may be used in conjunction with the chemotherapeutic treatment.

25 Once the tumor has been reduced, the benzimidazole is administered. Because of the relative safety of this material, it can be administered for from 14 days to 365 days as needed to maintain its effectiveness in reducing the regrowth of the cancer.

The following example is illustrative and are not meant to be limiting to the invention.

30

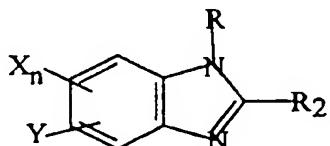
Example 1

In a mouse model for breast cancer cytoxin is administered to the animal reduce the tumor mass significantly. Carbendazim is administered to the mice at 4000, 5000, and 6000 mg/kg of body weight in a separate leg. The tumor continued to decrease in size and its regrowth was limited even after 180 days with the carbendazim treatment. The growth was

dose dependent. The cytoxin treated control had tumor regrowth after 100 days; and when stimulated with estrogen at day 115 had a rapid regrowth. Even with estrogen stimulation, the carbendazim treated animals had no significant change in tumor mass. After 130 days, carbendazim is administered to the mice (at 4000, 5000, and 6000 mg/kg of body weight) that 5 had been treated with cytoxin. The tumor continued to decrease in size and its regrowth was limited even after 180 days.

WHAT IS CLAIMED IS:

1. A medicament kit to treat cancer comprising combining two medicaments in a kit form, the first medicament is a safe and effective amount of a chemotherapeutic agent which 5 is in a dosage such that it is first administered to reduce the cancer significantly and wherein the second medicament is a safe and effective amount of a second pharmaceutical composition used to continue to treat the cancer comprising a benzimidazole selected from the group consisting of:

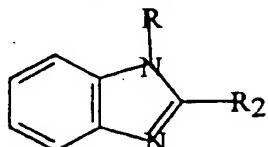


10

wherein X is hydrogen, halogen, alkyl of less than 7 carbon atoms or alkoxy of less than 7 carbon atoms; n is a positive integer of less than 4; Y is hydrogen, chlorine, nitro, methyl or ethyl; and R is hydrogen, CONHR₃ wherein R₃ is alkyl of less than 7 carbons or an alkyl group having from 1 to 8 carbon atoms, and R₂ is 4-thiazolyl or NHCOOR₁ wherein 15 R₁ is an aliphatic hydrocarbon of less than 7 carbon atoms or the pharmaceutically acceptable organic or inorganic acid addition salts.

2. A kit according to claim 1 wherein the kit contains from about 0.5 mg/kg body weight to about 400 mg/kg body weight of said chemotherapeutic agent medicament and 20 from about 2 mg/kg body weight to about 4000 mg/kg body weight of said benzimidazole medicament

3. A kit according to claim 1 or 2 wherein said benzimidazole medicament is selected from the group consisting of those having the formula:



25

wherein R is hydrogen and R₂ is selected from the group consisting of NHCOOR₁, wherein R₁ is methyl, ethyl or isopropyl or the pharmaceutically acceptable both organic and inorganic acid addition salts thereof.

30 4. A kit according to Claim 1, 2 or 3 wherein said chemotherapeutic agent medicament is selected from the group consisting of DNA-interactive Agents, Antimetabolites or Tubulin-Interactive Agents.

5. A kit according to Claim 4 wherein said chemotherapeutic agent medicament is selected from the group consisting of Asparaginase, hydroxyurea, Cisplatin, Cyclophosphamide, Altretamine; Bleomycin, Dactinomycin, Doxorubicin, Etoposide, Teniposde, and Plcamydin.

35 6. A kit according to claim 4 wherein said chemotherapeutic agent medicament is selected from the group consisting of Methotrexate, Fluorouracil, Fluorodeoxyuridine, CB3717, Azacytidine, Cytarabine, Flouxuridine, Mercaptopurine, 6-Thioguanine, Fludarabine, Pentostatin, Cycrabine, and Fludarabine.

40 7. A kit according to Claim 4, 5 or 6 wherein said chemotherapeutic agent medicament is in the form of a liposome.

8. A kit according to Claim 7 wherein said benzimidazole medicament is in a liquid form selected from the group consisting of aqueous solutions, alcohol solutions, emulsions, suspensions, and suspensions reconstituted from non-effervescent and effervescent preparations and suspensions in pharmaceutically acceptable fats or oils.

45 9. A kit according to Claim 7 wherein said chemotherapeutic agent medicament is selected from Taxol or Cisplatin and wherein the second medicament is a pharmaceutical composition comprising 2-methoxycarbonylaminobenzimidazole or the pharmaceutically acceptable organic or inorganic acid addition salts thereof and wherein said kit is for treating breast cancer in warm blooded mammals.

50 10. A kit according to claim 9 wherein said chemotherapeutic agent medicament is in a dosage from for about 3 to 14 days treatment and wherein said 2-methoxycarbonylaminobenzimidazole is a dosage for about 3 days to about 365 days.

55

INTERNATIONAL SEARCH REPORT

Inte: onal Application No
PCT/US 98/01147

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K31/415 A61K31/675 A61K31/335

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 96 32107 A (PROCTER & GAMBLE) 17 October 1996 see page 3, line 6-12; examples 1,2 see page 4, line 17-27; claims 1-9 see page 5, line 20 - page 8, line 4 see page 8, line 25 - page 9, line 17 ---</p> <p style="text-align: center;">-/-</p>	1-6,9

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

20 May 1998

Date of mailing of the international search report

01 07 1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kanbier, D

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/01147

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>DATABASE WPI Week 9551 Derwent Publications Ltd., London, GB; AN 95-400884 XP002065513 & JP 07 277 956 (POLA CHEM IND INC) , 24 October 1995 see abstract & PATENT ABSTRACTS OF JAPAN vol. 096, no. 002, 29 February 1996 & JP 07 277956 A (POLA CHEM IND INC), 24 October 1995, see abstract</p> <p>---</p> <p>US 5 149 527 A (ONCOTECH INC.) 22 September 1992 see column 5, line 36-43; claim 1</p> <p>---</p> <p>TEICHER ET AL: "Potentiation of Cytotoxic Therapies by TNP-470 and Minocycline in Mice Bearing EMT-6 Mammary Carcinoma" BREAST CANCER RESEARCH AND TREATMENT, vol. 36, no. 2, 1995, pages 227-236, XP002065511 see page 228, left-hand column see page 234</p> <p>---</p> <p>WO 94 04541 A (PHARMACIA & UPJOHN CO.) 3 March 1994</p> <p>---</p> <p>BISSERY ET AL: "Preclinical Profile of Docetaxel: Efficacy as a Single Agent and in Combination" SEMINARS IN ONCOLOGY; MANAGEMENT OF BREAST CANCER: A NEW HERAPEUTIC APPROACH, vol. 22, no. 6-S13, 1995, pages 3-16, XP002065512 see page 7, right-hand column - page 13, left-hand column</p> <p>-----</p>	7
A		1
A		1,5,6,9
A		9
A		1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 98/01147

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
Although claims 1-10 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/01147

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO 9632107 A	17-10-1996	AU	5389796 A	30-10-1996
		EP	0821586 A	04-02-1998
		NO	974695 A	08-12-1997
		PL	322733 A	16-02-1998
		AU	5802096 A	30-12-1996
		EP	0831816 A	01-04-1998
		NO	975660 A	09-02-1998
		WO	9640122 A	19-12-1996
US 5149527 A	22-09-1992	NONE		
WO 9404541 A	03-03-1994	AU	4787693 A	15-03-1994
		CA	2140653 A	03-03-1994
		EP	0655066 A	31-05-1995
		JP	8500112 T	09-01-1996